

**HCSS National Workshop on New Research Directions for High Confidence  
Transportation CPS: Automotive, Aviation, and Rail  
("Transportation CPS Workshop")  
(November 18-20, 2008)**

**Sheraton Premiere Hotel at Tysons Corner  
8661 Leesburg Pike  
Vienna, Virginia 22182**

**Draft Program Agenda**

- [Monday, November 17*      *AFRL Mixed Criticality Architecture Requirements  
(MCAR) Working Group (Closed Workshop)]*
- Tuesday, November 18**
- 7:00 A.M. – 8:00 A.M.*      *Continental Breakfast*
- 7:00 A.M. – 10:00 A.M.*      *Registration opens for the AFRL MCAR Workshop*
- [8:00 A.M. – 12:00 P.M.*      *AFRL MCAR Workshop (Open Session)]*
- [8:00 A.M. – 12:00 P.M.*      **Video taping of the Mobile Millennium demonstration  
at the Intelligent Transportation Systems World  
Congress live from New York, Dan Work, UC Berkeley]**
- 8:00 A.M. – 8:30 A.M.*      *MCAR Program Information: What is Mixed Criticality  
Architecture and Why is it Important?, Air Force  
perspective – David Homan (AFRL)*
- 8:30 A.M. – 9:30 A.M.*      *MCAR Contractor Team Briefs, Air-framer perspectives –  
Boeing, Lockheed Martin, and Northrop Grumman (NG)*
- 9:30 A.M. – 10:00 A.M.*      *Panel Discussion: Chris Gill (Washington University –  
St. Louis), Dave Homan (AFRL), Jim Paunika  
(Boeing), Prakash Sarathy (Northrop Grumman),  
Peter Stanfill (Lockheed Martin)*
- 10:00 A.M. – 10:15 A.M.*      *Break*
- 10:15 A.M. – 12:00 P.M.*      *Breakout sessions (Open discussions with contractor teams)  
Group 1: Northrop Grumman  
Group 2: Lockheed Martin  
Group 3: Boeing*
- [12:00 P.M.*      *MCAR Workshop adjourned]*

- [12:00 P.M. Registration opens for the Transportation CPS Workshop]***
- [12:00 P.M. – 1:00 P.M. Lunch (On your own)]***
- [1:00 P.M. Transportation CPS Workshop Opens]***
- 1:00 P.M. – 1:15 P.M. Call to Order and Opening Remarks, Workshop Co-Chairs – Radha Poovendran (University of Washington) and Raj Rajkumar (Carnegie Mellon)***
- 1:15 P.M. – 2:15 P.M. NITRD Agency Perspectives on CPS R&D – Helen Gill (NITRD/HCSS and NSF), Paul Miner (NASA), Al Wavering (NIST), Alan Kushner (NTSB), Ray DeCerchio (FAA), Paul Jones (FDA), Moderator – Bruce Krogh (Carnegie Mellon)***
- 2:15 P.M. – 3:00 P.M. Opening Keynote: Network Embedded Systems: Sensor Networks and Beyond, Shankar Sastry, Dean, School of Engineering, UC Berkeley***
- 3:00 P.M. – 3:15 P.M. Break***
- 3:15 P.M. – 3:40 P.M. USDOT Perspectives: Impact of New Data Sources on Mobility and Safety of the Transportation System, Ben McKeever, Research and Innovative Technology Administration, Intelligent Transportation Systems, Joint Program Office, USDOT***
- 3:40 P.M. – 4:00 P.M. Advance Research in the Concept of Integrated Active Transportation Systems, Lee Kunik, Chief Scientist, Federal Highway Administration, USDOT***
- 4:00 P.M. – 4:45 P.M. Automotive Sector Community Summary Statement on CPS R&D Needs (USCAR Representatives – Edward Griffor (Chrysler, via telecon), William Milam (Ford), Shige Wang (GM), Moderator – Raj Rajkumar***
- 4:45 P.M. – 5:30 P.M. Panel: Framing the CPS Discussion: Automotive Context (Edward Griffor, Alan Kushner, Ben McKeever, Bill Milam, Venkatesh Prasad (Ford), Raj Rajkumar, Shige Wang, Moderator – Bruce Krogh***
- [5:30 P.M. Meeting adjourned]***

**Wednesday, November 19**

- 7:30 A.M. – 8:30 A.M. *Continental Breakfast*
- [7:30 A.M. Registration for the Transportation CPS Workshop]**
- 8:30 A.M. – 8:40 A.M. Opening Remarks/Review of the day's agenda,  
*Workshop Co-Chairs – Radha Poovendran and Raj Rajkumar*
- 8:40 A.M. – 9:00 A.M. CPS Initiative: NSF and Beyond – *Ty Znati, Division Director, NSF/CISE*
- 9:00 A.M. – 9:30 A.M. Government Keynote: *NEXTGEN Aviation Safety, Amy Pritchett, Director of Aviation Safety, NASA*
- 9:30 A.M. – 9:50 A.M. *FAA Perspective on NEXTGEN, Cheryl Souders, FAA,*
- 9:50 A.M. – 10:05 A.M. *Break*
- 10:05 A.M. – 10:35 A.M. Net-Centric Working Group Perspective for NEXTGEN Aviation, *Gene Hayman, Industry Co-Chair, Net-Centric Working Group Perspective for NEXTGEN Aviation*
- 10:35 A.M. – 11:05 A.M. Academic Perspective: Aviation Safety Management Systems, *John Hansman (MIT)*
- 11:05 A.M. – 11:35 A.M. Industry Perspective: NEXTGEN Aviation, *John Osterholz, VP, BAE Systems*
- 11:35 A.M. – 12:00 P.M. Mobile Millennium demonstration at the Intelligent Transportation Systems World Congress live from New York, *Dan Work, UC Berkeley*
- 12:00 P.M. – 1:00 P.M. *Box Lunch* (in plenary ballroom) (3-minute selected presentations aviation, auto, and rail position papers),  
*Co-Moderators – Sushil Birla (NRC) and Jonathan Sprinkle (Arizona)*
- 1:00 P.M. – 2:00 P.M. *Panel – CPS for Aviation: Looking Forward*
- *Cesar Munoz (National Institute of Aerospace - NASA Langley)*
  - *Claire Tomlin (UC Berkeley) (participation via telecon)*
  - *Mary E. Miller, Raytheon*
  - *Pam Binns (Honeywell)*
- Moderator – Raj Rajkumar*

- 2:00 P.M. – 2:30 P.M. Crosscutting CPS Needs in Industry, *Janos Sztipanovits (Vanderbilt)*
- 2:30 P.M. – 2:35 P.M. Guidance for afternoon sessions, *Workshop Co-Chairs – Radha Poovendran and Raj Rajkumar*
- 2:35 P.M. – 4:30 P.M. *B/O Session 1: Verification and Validation, Co-Moderators – Bill Milam and Ashish Tiwari*
- a. Formal Methods (model checking and theorem proving)
  - b. Capturing requirements in formal semantics as properties/Attributes that are V&V'd
  - c. Evidentiary chain for V&V; Tracking what has been V&V'd
- B/O Session 2: Mixed Criticality, Co-Moderators – Jim Paunicka (Boeing) and Sushil Birla*
- Management of shared resources amongst applications under different
  - Static and dynamic issues
- B/O Session 3: Platform Challenges, Co-Moderators – Raj Rajkumar and Shige Wang*
- d. How do we better predict and assert properties (functional and non-functional) in the context of an uncertain environment?
  - e. What new platform services would allow for more predictable assembly of CPS?
  - f. What platform services are consistent across all three domains?
  - g. What platform services are unique for the domains?
- B/O Session 4: Autonomy and Control, Co-Moderators – Jonathan Sprinkle and TBD*
- h. How do we create multi-level supervisory systems?
  - i. What are the key design paradigms of such systems?
  - j. How would multi-level supervisory systems interact with each other?
  - k. How to maintain legally required and customer expected attributes at vehicle level while interacting with other vehicles and infrastructure?
  - l. Varying levels of autonomy and human control.
    - i. Example: Drive car to theatre, tell it to park and call it back when ready to depart. Fully autonomous commute allowing driver to

work while vehicle handles traffic  
congestion and alternate routing.

- m. How do these scenarios play out when trustworthy  
and no so trustworthy components are combined?

*B/O Session 5: Infotronics/Infotainment, Co-Moderators –  
Venkatesh Prasad and Rance Cleveland*

- n. How to we managed the line between consumer  
electronics and mission critical applications?  
i. Especially as we are now starting to see  
overlap of information  
o. How do we enable customization for customer’s  
needs and desires without altering performance  
characteristics in shared environments?

*(3:30 P.M.*

*Break /Refreshments available)*

*4:30P.M. – 5:30 P.M.*

Concurrent roadmapping breakout sessions:

- Ground Transportation, *Co-Moderators –  
Bill Milam and Venkatesh Prasad*
- Aviation, *Co-Moderators – David Corman (Boeing)  
and Steve Miller (Rockwell Collins)*

*5:30 P.M.*

Meeting adjourned

*5:30 P.M. – 7:30 P.M.*

*Reception (Hotel hospitality area)*

**Thursday, November 20**

*7:30 A.M. – 8:30 A.M.*

*Continental Breakfast*

*[7:30 A.M.*

***Registration for Transportation CPS Workshop]***

*8:30 A.M. – 8:45 A.M.*

Opening Remarks/Review of the day’s agenda

*8:45 A.M. – 9:05 A.M.*

The NITRD Program and Strategic Plan, *Chris Greer,  
Director, National Coordination Office for Networking  
Information Technology R&D*

*9:05 A.M. – 9:35 A.M.*

*Workshop Keynote: Industry Perspectives on CPS R&D  
Challenges and Opportunities for Collaboration,  
Don Winter, VP, Boeing*

*9:35 A.M. – 9:45 A.M.*

*(Invited Talk) Positive Train Control, Ruben Pena  
Association of American Railroads*

<i>9:45 A.M. – 10:00 A.M.</i>	<i>Break</i>
<i>10:00 A.M. – 10:30 A.M.</i>	<i>(Invited Talk) EU Perspective: Reference Technology Platform for Design Processes for Safety Relevant Embedded Systems , Werner Damm, Prof. Mitglied des Vorstands</i>
<i>10:30A.M. – 11:00 A.M.</i>	<i>AMTRAK (Placeholder)</i>
<i>11:00 A.M. – 12:00 P.M.</i>	<p>60% CPS Commonalities Across the Three Sectors: Design and Implementation for Certifiably Dependable Systems, <i>Moderator – Bruce Krogh</i></p> <ul style="list-style-type: none"> <li>• <i>Panel: Alex Bayen (UC Berkeley), Bill Milam, Werner Damm, Steve Miller</i></li> <li>• <i>Open Discussion (30 minutes)</i></li> </ul>
<i>12:00 P.M. – 12:30 P.M.</i>	Continuation of 3-minute position paper presentations covering aviation, auto, and rail, <i>Moderator – Ben Watson</i>
<i>12:30 P.M. – 1:30 P.M.</i>	<i>Box Lunch</i> (in plenary ballroom) (Resumption of 3-minute position paper presentations), <i>Co-Moderators – TBD</i>
<i>1:30 P.M. – 2:30 P.M.</i>	Continuation of concurrent B/O sessions
<i>2:30 P.M. – 4:00 P.M.</i>	B/O session summary reports ( <i>B/O Session Moderators</i> )
<i>4:00 P.M. – 4:30 P.M.</i>	<i>Where do we go from here? Report preparation discussion Workshop Co-Chair – Radha Poovendran</i>
<b><i>[4:30 P.M.</i></b>	<b><i>Workshop adjourned]</i></b>